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PROTECTIVE IRRIGATION WORKS,
RAJPUTANA.

BANDANWARA TANK PROJECT
AT CHINCH,
BANSWARA STATE.

1905.

AJMER:
SCOTTISH MISSION INDUSTRIES CO., LTD.

1905.

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ABSTRACT ESTIMATE OF COST.

PLANS.

- I.—Index Map and Contour Plan.
- II.—Longitudinal Section and Cross Sections of Dam.
- III.—Detail of Sluices.

BANDANWARA TANK PROJECT AT CHINCH, BANSWARA STATE.

Reference.—Para. 12 of Report on Irrigation in the Banswara State.

REPORT.

About $1\frac{1}{2}$ miles south-east of Chinch there is an old breached earthen Dam, formerly forming the Bandanwara Tank. As the catchment area is $3\frac{3}{8}$ square miles, and there is good land below the site available for irrigation, it seemed advisable to restore the Dam and raise it to store all the water available, and to construct Sluices for Irrigation. Surveys were therefore made, and this Estimate and Plans have been prepared for carrying out the work.

Site described.

2. Allowing a run-off of 10 per cent. of the average rainfall of 35 inches from the $3\frac{3}{8}$ square miles of catchment area, 27.56 m.c.ft. of water will be available for storage.

Water available for Storage.

3. The following table gives the water-spread and capacity of the Tank at different contours; R.L. 100 has been taken as bed level of the nullah where the main breach of the Dam occurred :—

Water-spread and Capacity.

R. L.	Water-spread in s.ft.	Capacity between each Contour in m.c.ft.	Capacity below each Contour in m.c.ft.
120	10,450,000	26.07	54.32
117	7,040,000	11.76	28.25
115	4,790,000	13.61	16.49
110	1,090,000	2.66	2.88
105	180,000	.22	.22
100	Bed level.		...

It is proposed to make R.L. 117 Weir level; this gives a capacity to the Tank slightly in excess of that estimated as available for storage.

4. The maximum discharge from the $3\frac{3}{8}$ square miles of catchment is 2,054 cusecs (Dicken's Formula), and a Weir 206 r.ft. in length is required to discharge this with a 2-ft. head.

Maximum Discharge and Length of Weir.

5. As the country at either end of the Dam is flat it is proposed to allow any waste water there may be to spill over at the ends of the earthen Dam, which will be pitched for 20 ft. both in front and rear to prevent any chance of cutting away.

Weir.

As there is rice land below, any water that spills over can be caught below by low earthen field banks to benefit the rice cultivation.

Dam. 6. The Dam will be entirely of earthwork, with crest R.L. 122 or 5 ft. above Weir level; the top width will be 10 ft., and front and rear slopes 3 to 1 and 2 to 1 respectively.

The total length of the Dam will be 3,400 r.ft.

From chainage 1,320 to chainage 2,930, a length of 1,610 r.ft., where the nullah is crossed, and the breaches in the old embankment occur, it is proposed to protect the front slope up to R.L. 122 or 1 ft. above flood level, with pitching, consisting of 9 inches of dry stone on 3 inches of kunkar or chips.

Sluices. 7. Two Sluices are provided, one at chainage 1,500 on the right bank of the nullah, with sill level R.L. 107; and one at chainage 3,140, on the left bank, with sill level R.L. 110.

The total capacity of the Tank above R.L. 107 is 27.6 m.c.ft., sufficient to irrigate 276 acres, of which Sluice No. 1 on the right bank will be able to irrigate 149 acres, leaving 127 for Sluice No 2.

Sluice No. 1 should be able to give a first watering of 6 inches in 30 days of 12 hours' flow to the 149 acres it commands, or—

$$D = \frac{149 \times 43,560 \times \frac{1}{2}}{30 \times 12 \times 60 \times 60} = \frac{3,245,220}{1,296,000} = 2.5 \text{ cusecs};$$

and Sluice No. 2 during the same period discharge a first watering of 6 inches to the 127 acres it will irrigate, or—

$$D = \frac{127 \times 43,560 \times \frac{1}{2}}{1,296,000} = \frac{2,766,060}{1,296,000} = 2.13 \text{ cusecs.}$$

The two Sluices will therefore discharge 6 m.c.ft. during the first month, and for the remaining three months of the Irrigation Season they must discharge the balance available, or—

$$D = \frac{(27.6 - 6)}{3 \times 2.592} = \frac{21.6}{7.776} = 2.77 \text{ cusecs, or each Sluice will discharge 1.39 cusecs.}$$

A Sluice 6 inches in diameter is sufficient to discharge the required quantity, and has been provided.

Design for Sluice. 8. Both Sluices are similar in design, and consist of a masonry Sluice well 6 ft. in diameter, with Ccre-wall in rear 10 ft. in length on either side. An opening $1\frac{1}{2}$ ft. wide runs up the face of the well, closed by slabs with 6-inch holes at every ft. in height for the entrance of the water.

The Wing-walls in front will be built parallel to each other for 8 ft. in length, and $3\frac{1}{2}$ ft. apart, forming an outer chamber; cut-stone grooves being provided into which planks can be placed, with earth between, when it is necessary to cut off the water from entering the well, to repair the Sluice or for any other reason. An iron grating with vertical bars is also provided in front to prevent brushwood or anything likely to injure the valve or pipe entering the well. In front of this outer chamber the Wing-walls splay out till the toe of the front slope is reached.

The Sluice valve is in the well and is worked by a vertical rod with screwed head, showing clearly how much the valve is open at any time.

The pipe passes through the rear wall of the well into an arched masonry drain connected with the Irrigation Channel. (See Plan No. 3.)

9. The Irrigation Channels will have a fall of 2 ft. per mile, and to discharge 2.77 cusecs, the maximum required, will have a bed width of 2 ft., depth of 1 $\frac{1}{2}$ ft., and side slopes of 1 to 1.

Irrigation Channels.

Provision has been made in the Estimate for Irrigation Channels 1 mile in length on either bank of the nullah.

10. The following is the Abstract Estimate of the cost of carrying out the work proposed :—

Abstract Estimate of Cost.

					Rs.
(1) Dam	..	...	...	...	9,250
(2) Sluice No. 1	...	...	...	...	1,458
(3) Sluice No. 2	...	...	...	...	1,074
(4) Irrigation Channel	...	...	...	...	163
(5) Contingencies	...	..	...	...	597
					12,542

11. If the whole 276 acres, for which there will be water are irrigated, allowing Rs. 4 per acre, a Revenue of Rs. 1,104 should be realized, giving a profit of 8 $\frac{3}{4}$ per cent. on the estimated cost of the work now proposed ; or adding the value of the earthwork of the existing Dam at estimated rates, Rs. 822, a profit of 8 $\frac{1}{2}$ per cent. on the total capital cost should be realized.

Revenue.

12. Stone for building, and lime are procurable north of Chinch, three miles from the site.

Materials.

13. The Surveys, Plans, and Estimate have been prepared by Overseer Ramsahai under the directions of the Superintending Engineer, Protective Irrigation Works, Rajputana.

Preparation of Project.

SPECIFICATION.

14. All the dimensions and measurements of the work are given in the Plans and Estimate, and are to be strictly adhered to.

Dimensions.

15. The central line and slopes of Dam to be marked out with trenches 1 ft. deep and 1 ft. broad, showing permanently the inner and outer slopes and the breadth of the top of embankment.

Marking out.

16. The old surface to be picked up for 9 inches in depth, and all grass and roots removed, and the slopes of the existing Dam to be cut away in steps before the new earthwork is commenced.

Earthwork.

The new earth to be then thrown down in layers not exceeding 9 inches in depth, and each layer carefully consolidated before the next is commenced. No excavation for earthwork to be within 100 ft. of either toe of the Dam.

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Masonry. 17. The masonry of the ~~outlet~~ Sluices, to be of rubble stone set in lime mortar; only hard and durable stones to be used, and the masonry to be kept wet during construction. All the stones to be hammer-dressed and to break joint in the same as well as in the successive courses.

All stones are to be laid on their natural beds; where there is batter the beds of the stones are to be at right angles to the batter. Hollows between the larger stones to be filled in with smaller ones completely embedded in mortar. No empty hollow to be left nor spaces filled wholly with mortar or rubbish where pieces of stones ought to have been inserted.

The faces of the masonry in contact with the earth to be left quite rough, and those remaining exposed to be smoothed and pointed with lime mortar.

Concrete. 18. The concrete to consist of 3 parts broken stone to 1 part lime mortar, well mixed together before putting in foundations, and to be laid in 6-inch layers, and well rammed.

Mortar. 19. The lime to be good stone lime burnt in kilns. The mortar to consist of 1 part of lime to $1\frac{1}{2}$ parts surkee.

F. ST.-G. MANNERS SMITH,
AJMER,
1st November 1905. SUPERINTENDING ENGINEER,
Protective Irrigation Works, Rajputana.

ABSTRACT ESTIMATE OF COST.
Bandanwara Tank Project at Chinch,
Banswara State.

Quantity or No.	Items.	Rate.	Per	Amount.	Total.	
					Rs.	Rs.
1. DAM.						
,649 c.ft.	(a) Earthwork	5 0	1000 c.ft.	7,573	7,573	
,906 "	(b) Pitching	3 0	100 "	1,437		
,969 "	(c) Kunkar	1 8	100 "	240		
					1,677	
						9,250
2. SLUICE No. 1.						
621 c.ft.	(a) Excavation (earth) ...	6 0	1000 c.ft.	34		
,833 "	(b) Concrete	9 0	100 "	165		
,055 "	(c) Masonry	15 0	100 "	758		
285 c.ft.	(d) Arch Masonry	20 0	100 "	57		
117 r.ft.	(e) Iron Ladder	0 4	r.ft.	29		
19 s.ft.	(f) Stone Slab 2" thick ...	0 8	s.ft.	10		
3 No.	(g) Stone Brackets	2 0	each	6		
1 No.	(h) Sluice Pipe (complete, 6" diameter)	250 0	"	250		
52 s.ft.	(i) Iron Grating with vertical bars	1 0	s.ft.	52		
31 c.ft.	(j) Woodwork	3 0	c.ft.	93		
7 r.ft.	(k) Iron Girder	0 8	r.ft.	4		
					1,458	
						1,458
3. SLUICE No. 2.						
,817 c.ft.	(a) Excavation	6 0	1000 c.ft.	23		
,456 "	(b) Concrete	9 0	100 "	131		
,124 "	(c) Masonry	15 0	100 "	469		
,239 "	(d) Arch Masonry	20 0	100 "	48		
90 r.ft.	(e) Iron Ladder	0 4	r.ft.	23		
13 s.ft.	(f) Stone Slabs 2" thick ...	0 8	s.ft.	7		
2 No.	(g) Stone Brackets	2 0	each	4		
1 No.	(h) Sluice Pipe 6" diameter ...	250 0	"	250		
40 s.ft.	(i) Iron Gratings with vertical bars	1 0	s.ft.	40		
25 c.ft.	(j) Woodwork	3 0	c.ft.	75		
7 r.ft.	(k) Iron Girders	0 8	r.ft.	4		
					1,074	
						1,074
4. IRRIGATION CHANNEL.						
626 c.ft.	(a) Excavation	4 0	1000 c.ft.	163	163	163
	Total	...	...	...	...	11,945
	Contingencies	5 0	per cent.	...	...	597
	GRAND TOTAL	...	...	...	...	12,542

